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AUTHOR	Vitola, Bart M.; Wilbourn, James M.
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ABSTRACT

Male and female enlistee samples were compared for total groups and by enlistment region in terms of their performance on the Airman Qualifying Examination (AQE) and the Armed Services Vocational Aptitude Battery (ASVAB). Women in the Air Force (WAF) test-retest performance was evaluated on the Armed Forces Women's Selection Test (AFWST) which is used throughout the Department of Defense. WAF performance on the AFWST was compared with their performance on the Armed Forces Qualification Test (AFQT), the instument currently used to establish the mental ability level of males entering the military services. It was found that mean aptitude indexes have increased over time for both male and female enlistees on the AQE and the ASVAB. A positive relationship was demonstrated between level of education and aptitude index. Regional aptitude patterns for WAF did not conform to those traditionally found for male enlistees. A significant difference was found in WAF performance in a test-retest situation for both the AQE and the AFWST. WAF performance on the AFQT was somewhat lower than that of male enlistees, with the difference attributed primarily to the lower achievement by the WAF on the Mechanical Comprehension subtest. (Author)

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AIR FORCE HUMAN RESOURCES LABORATORY

AFHRL-TR-71-9

COMPARATIVE PERFORMANCE OF MALE AND FEMALE ENLISTEES ON AIR FORCE SELECTION MEASURES

By

Bart M. Vitola
James M. Wilbourn

PERSONNEL DIVISION
Lackland Air Force Base, Texas

February 1971

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AIR FORCE SYSTEMS COMMAND
Lackland Air Force Base, Texas

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FOREWORD

This study presents various comparisons of male and female Air Force enlistees in terms of average aptitude, learning ability level, and geographic region of enlistment. The research was carried out under Project 7717, Selection, Classification, and Evaluation Procedures for Air Force Personnel; Task 771705, Selection and Classification Instruments for Airman Personnel Programs; and Task 771711, Research on Alternative Approaches to Selection and Classification of Air Force Enlisted Personnel.

This report has been reviewed and is approved.

George K. Patterson, Colonel, USAF
Commander

ABSTRACT

Male and female enlistee samples were compared for total groups and by enlistment region in terms of their performance on the Airman Qualifying Examination (AQE) and the Armed Services Vocational Aptitude Battery (ASVAB). Women in the Air Force (WAF) test-retest performance was evaluated on the Armed Forces Women's Selection Test (AFWST) which is used throughout the Department of Defense. WAF performance on the AFWST was compared with their performance on the Armed Forces Qualification Test (AFQT), the instrument currently used to establish the mental ability level of males entering the military services. It was found that mean aptitude indexes have increased over time for both male and female enlistees on the AQE and the ASVAB. A positive relationship was demonstrated between level of education and aptitude index. Regional aptitude patterns for WAF did not conform to those traditionally found for male enlistees. A significant difference was found in WAF performance in a test-retest situation for both the AQE and the AFWST. WAF performance on the AFQT was somewhat lower than that of male enlistees, with the difference attributed primarily to the lower achievement by the WAF on the Mechanical Comprehension subtest.

SUMMARY

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Problem

Air Force selection and classification procedures are affected by the fluctuations of performance of male and female personnel on qualifying aptitude and learning ability measures. When one measurement instrument is to be replaced by another or when research data demonstrate peculiarities of test performance, various comparative analyses should be undertaken to establish an empirical basis for making changes and taking remedial actions.

Since the Armed Services Vocational Aptitude Battery (ASVAB) has replaced the Airman Qualifying Examination (AQE) in the military high school testing program, it would be useful to make comparative analyses of the performance of males and females on these instruments. Another concern which requires investigation is the difference between the qualifying scores of female applicants and those obtained on retest. Because unusual fluctuations have been observed in this regard, certain questions have been raised about test administration practices. There is a further consideration of replacing the Armed Forces Women's Selection Test (AFWST) with the Armed Forces Qualification Test (AFQT). Before undertaking necessary standardization procedures, it would be useful to make certain gross comparative analyses to establish feasibility of the replacement.

Approach

To investigate comparative performance of males and females on the ASVAB, a basic trainee sample of WAF was given the ASVAB and the AFWST. Means and standard deviations were computed for each aptitude index of the ASVAB and compared to means and standard deviations of males whose scores were used to establish norms for the ASVAB. Average AQE performance on each aptitude index by region of country was obtained. Comparisons were made on the educational variable college versus non-college, and intercorrelations among operational and experimental variables were computed.

The second study involved four samples of WAF and one of male enlistees. The samples were retested with the instrument used in their selection for Air Force service to determine the consistency of test scores and to determine the effect of day of training on retest performance. Means and standard deviations were computed and compared to operational scores. Percentages of WAF enlistees who would have failed to qualify for the Air Force on the basis of retest scores were also computed.

For the third problem, another sample of WAF enlistees was given the AFWST and the AFQT. Comparisons were made between operational and experimental scores on the two measures. Means and standard deviations were computed for the subtests of AFWST and AFQT as well as raw composite and centile scores.

Results and Conclusions

1. Results of the comparison of the performance of males and females on the AQE and ASVAB were as follows. A positive relationship between educational level and test performance was again demonstrated. Female enlistees demonstrated greater abilities in the electronics area than they have previously shown, a finding which suggests a potential resource in female personnel for these career areas. Investigation of regional aptitude patterns of the female population should be continued as a larger sample is accumulated.

2. Comparison of operational test scores with experimental scores obtained on different days of basic training revealed lower retest scores for the WAF sample regardless of the day on which they were tested. For the male sample, only the Administrative composite score was lower on retest. These findings indicate a need for more stringent controls in operational test administration procedures.

3. Comparison of male and female performance on the AFQT revealed a lower mean composite score for the WAF (40.62) compared to that of current male enlistees (54.0). The difference was primarily attributed to lower scores for the WAF on the Mechanical Comprehension subtest. Although more research is necessary to develop appropriate norms and keys to accommodate for recognized sex differences in aptitude areas, it appears that the AFQT can be adapted for use in screening WAF applicants.

This summary was prepared by B.M. Vitola, Personnel Systems Branch, Personnel Division, Air Force Human Resources Laboratory.

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COMPARATIVE PERFORMANCE OF MALE AND FEMALE ENLISTEES ON AIR FORCE SELECTION MEASURES

I. INTRODUCTION

Description of Test Instruments

The Airman Qualifying Examination (AQE) is used by the Air Force Recruiting Service in the selection and classification of non-prior-service applicants to determine their enlistment qualifications and aptitudes. The AQE is a two-hour test yielding four aptitude indexes: Mechanical, Administrative, General, and Electronics. A 20-unit centile scale (ranging from 01, 05, 10, . . . , 95), with 5 percent of the normative base designated by each scale point, is used as the basis for determining the indexes on the four composites (Vitola & Madden, 1967). In 1962 Recruiting Service initiated a testing program which has been implemented in many high schools throughout the country. This program, which provides for the aptitude testing of high school seniors, initially used the AQE as its evaluation instrument.

In September 1968 the AQE was replaced in the high school testing program by the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB is a Department of Defense instrument developed jointly by the Army, Navy, Air Force, and Marines. Its initial purpose was to provide a single test for use in the high school program that would be suitable for all of the military services. Essentially, the ASVAB yields four aptitude composites similar to those of the AQE. It contains eight subtests of 25 items and one of 100 items; each subtest is separately timed. In 1968 the ASVAB was standardized for Air Force use as a selection and classification instrument for non-prior-service applicants (Vitola & Alley, 1968). In the event the ASVAB replaces the AQE, it will give the Air Force a single test instrument for use in high schools and enlistment recruiting offices. AQE and ASVAB subtest components, together with some descriptive correlational data, are shown in Tables 10, 11, and 12 in the appendix.

The Armed Forces Qualification Test (AFQT), a Department of Defense test, is given to all male pre-inductees and enlistees. The test evaluates abilities in the verbal, numerical, spatial, and mechanical areas. The AFQT centile score (ranging from 01, 02, 03, . . . , 99) represents a composite index of performance in these areas. AFQT scores may be estimated from the ASVAB.

Currently, applicants for Women in the Air Force (WAF) are tested with both the AQE and the Armed Forces Women's Selection Test (AFWST), another Department of Defense Test. As the executive agency for the AFWST, the Air Force developed and standardized the forms currently in use, Forms 5 and 6 (McReynolds, 1961). Administration of the AFWST requires approximately one hour and fifteen minutes. Three subtests are included: Verbal Analogies, Arithmetic Reasoning, and Word Knowledge. The three subtest scores are summed, and the total raw score is converted to a centile score (ranging from 01, 02, 03, . . . , 100).

Previous Test Research

Several studies comparing male and female performance on the AQE have been made to determine relationships between the AQE aptitude indexes and such variables as region of enlistment and educational level. One study comparing AQE performance of male and female examinees revealed a traditional pattern of regional differences (Lecznar, 1965). Enlistees from North Central and Midwest areas had high scores on the Mechanical composite, enlistees from the Northeast had high scores on the Administrative and General composites, and enlistees from the Far West had high scores on the Electronics composite.

Another study describing the performance of males and females on the AQE permits comparison of twelfth-grade boys and girls by type of high school, type of curriculum, region of the country, and size of city within each region (Tupes, 1965). From the distributional data presented in that study, high school vocational counselors are able to determine the relative standing of students by comparing obtained AQE aptitude indexes with the distributions for appropriate normative subgroups.

In an unpublished study of WAF test performance, variance was found between operational and experimental test scores for the same selection instrument.[1] Another unpublished study concerning testing procedures used at recruiting centers indicated that variations in test-retest performance on the AFWST were due to maladministration and incorrect scoring procedures.[2] A similar study compared male performance on two administrations of the AFQT, the first test administered in recruiting centers and then a retest at Lackland Air Force Base (Daily, 1951). Marked statistical differences were found between the scores, with much lower scores achieved on the second test administration.

Research Problem

This study was concerned with three areas of investigation. Comparative analyses were made of (*a*) the performance of male and female enlistees on two aptitude measures, the ASVAB and the AQE; (*b*) the performance of male and female enlistees on two administrations of the same testing instruments; and (*c*) the performance of male and female enlistees on the AFQT.

In the first area, ASVAB performance of WAF enlistees and male enlistees was compared. Distributions of other data were computed to show relationships between ASVAB performance and region of enlistment and educational level. These data should be of interest to the WAF Directorate, the Air Force Recruiting Service, and high school guidance counselors.

The second area of investigation focused on the comparative performance of examinees in a test-retest situation. Since the value of any testing program is to some extent a function of the reliability of the administrative testing procedures, as well as the reliability of the test instrument itself, discrepant findings in this regard would allow for remediation where indicated.

The third part of the study concerned relationships between the AFWST and the AFQT. Because there would be some advantage in using the same selection instrument for screening both male and female applicants for enlistment, the feasibility of replacing the AFWST with the AFQT to determine WAF enlistment qualifications is being considered by basic military training personnel.

II. COMPARATIVE PERFORMANCE OF MALE AND FEMALE ENLISTEES ON THE AQE AND THE ASVAB

Collection of Data

WAF basic trainees (N = 1,011) who arrived at Lackland Air Force Base from June through November 1968 comprised the research sample. Each examinee was given the ASVAB and either AFWST Form 7 or AFWST Form 8.[3] Tests were administered in a counterbalanced order to offset practice effects. A test record card, to be used as the basic source of information for the analyses, was completed for each examinee. The data included the following operational and experimental variables:

1. Years of education completed
2. Region of enlistment
3. AFWST subtest raw scores (3)
4. AFWST converted centile
5. AQE aptitude indexes (4)
6. ASVAB subtest raw scores (9)
7. ASVAB composite raw scores (4)
8. ASVAB aptitude indexes (4)

Means and standard deviations for each aptitude index of the ASVAB were compared with the means and standard deviations of males who were part of the ASVAB norming sample. Average AQE performance on each aptitude index by region of the country was obtained. Analyses were made to relate patterns of performance to the educational variable college versus non-college. Intercorrelations among the operational and experimental variables were also computed. These intercorrelations are shown in Table 13 in the appendix.

Analysis of Data

Comparison of the educational and aptitude data with past patterns of performance revealed certain variations and similarities. The mean aptitude indexes for WAF with some college were higher than the means for WAF with no education beyond high school.These results are consistent with the typical finding of a positive relationship between aptitude index and educational level. The data are presented in Table 1.

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[1] "Effectiveness of the Operational Administration of WAF Selection Tests," an unpublished technical memorandum by Jane McReynolds and L.D. Brokaw, May 1955.

[2] "Monitoring of the Airman Qualifying Examination Given at Armed Forces Examining Stations for Selective Recruiting," an unpublished technical memorandum by D.B. Gragg and R.A. Williams, May 1959.

[3] Forms 7 and 8 of the AFWST are experimental forms, developed as revisions of the currently operational Forms 5 and 6.

Table 1. **Mean ASVAB Aptitude Indexes for WAF Enlistees at Two Educational Levels**

Enlistee Group	N	Mean Aptitude Index for Enlistee Group							
		Mechanical		Administrative		General		Electronics	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
High School Only	852	23.00	13.16	68.45	20.19	63.26	19.55	49.90	20.84
High School Plus Some College	147	30.59	16.33	75.95	18.33	75.54	18.68	60.55	21.87

Table 2. **Mean AQE-62 Aptitude Indexes for Male and Female Enlistees**[a]

Enlistee Group	N	Mean Aptitude Index for Enlistee Group			
		Mechanical	Administrative	General	Electronics
Males tested before Mar 63	5,442	50.22	62.84	56.30	48.27
Males tested after Mar 63	5,373	54.51	56.59	56.99	49.28
Females tested before Mar 63	2,826	24.55	62.39	52.58	33.43
Females tested after Mar 63	2,719	25.92	56.13	53.38	34.19

[a]After Lecznar, 1965, p. 4.

Table 3. **Mean AQE-66 and ASVAB Aptitude Indexes for Male and Female Enlistees**

Enlistee Group	N	Mean Aptitude Index for Enlistee Group							
		Mechanical		Administrative		General		Electronics	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Airman Qualifying Examination-66									
Males	4,038	63.01	18.68	61.67	20.59	63.57	19.63	64.72	20.48
Females	999	39.45	18.58	72.66	14.61	70.28	13.22	55.98	17.96
Armed Services Vocational Aptitude Battery									
Males	4,371	59.50	17.59	59.72	17.65	60.84	17.57	60.83	17.87
Females	999	24.11	14.30	69.56	20.11	65.07	19.91	51.46	21.33

In an earlier study, mean aptitude indexes derived from AQE-62 were compared by sex groups (Lecznar, 1965). These data are presented in Table 2. Table 3 presents means and standard deviations for male and female enlistees on AQE-66 and the ASVAB. Comparison of these data with data in Table 2 shows a general increase in aptitude level for male enlistees and, in most instances, for female enlistees. On AQE-62, in no instance did females achieve higher mean scores on any aptitude index than did males; means were essentially equal on the Administrative index. On AQE-66 and the ASVAB, mean scores on the Administrative and General indexes were higher for females than for males, and their scores on the Electronics index, while lower, were more similar to the scores of males than those previously obtained. In essence, it is apparent that 1968 enlistees, both male and female, demonstrated higher levels of aptitude than have previously been observed. Centile distributions for the four ASVAB aptitude indexes for the WAF sample are shown in Table 14 of the appendix.

To investigate ASVAB and AQE-66 regional aptitude patterns, the WAF enlistee sample was divided into nine enlistment region subgroups. The enlistment regions were defined as follows:

Table 4. **Mean AQE-66 and ASVAB Aptitude Indexes for WAF Enlistees by Enlistment Region**
(N = 990)

Enlistment Region	N	Mean Aptitude Index for Enlistment Region							
		Mechanical		Administrative		General		Electronics	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
AQE-66									
1	63	33.49	19.46	75.08	13.87	71.19	13.41	54.21	20.94
2	120	38.83	18.14	74.29	15.28	69.33	14.29	54.46	18.57
3	133	38.20	18.87	74.66	13.74	70.23	12.99	58.01	17.47
4	112	38.66	16.52	72.95	13.39	70.54	11.88	59.92	11.85
5	84	35.77	20.67	72.56	14.69	69.70	13.83	57.50	19.03
6	143	42.62	20.61	71.29	15.10	71.47	13.85	58.78	16.44
7	99	42.32	16.82	73.18	13.84	71.01	12.43	59.60	16.56
8	93	42.47	16.39	75.65	13.80	70.05	12.17	52.37	17.74
9	143	39.86	17.64	67.20	15.14	68.74	13.37	56.71	17.54
ASVAB									
1	63	22.87	13.53	69.21	17.28	67.46	18.01	49.37	21.78
2	120	22.17	12.77	68.08	21.09	64.29	18.83	50.04	20.46
3	133	24.08	15.31	69.95	22.65	65.04	20.32	65.04	20.32
4	112	21.57	13.96	65.80	19.53	61.92	20.81	46.34	21.14
5	84	25.01	13.63	70.00	19.35	65.60	18.41	53.05	20.47
6	143	26.46	14.87	72.13	19.05	68.22	20.44	55.74	21.21
7	99	27.18	13.14	72.78	18.87	66.52	19.82	56.16	18.43
8	93	18.88	11.91	63.19	20.87	57.85	20.14	44.50	20.35
9	143	27.43	15.31	73.67	17.27	68.18	18.28	55.28	20.58

Region 1. Maine, New Hampshire, Rhode Island, Massachusetts, Vermont, Connecticut
Region 2. New York, New Jersey
Region 3. Delaware, Pennsylvania, Maryland, Virginia, West Virginia
Region 4. Alabama, Florida, North Carolina, South Carolina, Tennessee, Georgia, Mississippi
Region 5. Kentucky, Ohio
Region 6. Illinois, Indiana, Michigan, Wisconsin
Region 7. Colorado, Iowa, Kansas, North Dakota, South Dakota, Minnesota, Missouri, Nebraska, Wyoming
Region 8. Arkansas, New Mexico, Louisiana, Texas, Oklahoma
Region 9. Arizona, California, Idaho, Utah, Montana, Nevada, Oregon, Washington, Alaska, Hawaii

Table 4 presents mean AQE-66 and ASVAB aptitude indexes for female enlistees by region of the country. These data are presented simply as an item of interest since some of the regional groups are too small to provide stable estimates; values for samples of less than 100 cases should be regarded as gross estimates. If data were collected over a longer period of time, shifts in population characteristics as a function of the time covered might well occur.

Table 5, based on the findings from an earlier study (Vitola, Valentine, & Tupes, 1967), shows mean AQE-66 aptitude indexes for male accessions by enlistment region. The data indicate that males who achieved relatively high Mechanical and Electronics aptitude indexes on the AQE-66 tended to be recruited from regions 6, 7, and 9. Personnel who achieved relatively high General aptitude indexes were typically from region 1. High Administrative aptitude indexes were seen for regions 1 and 7. Males from regions 4 and 8 achieved lower mean aptitude scores than enlistees from other regions.

Table 5. **Mean AQE-66 Aptitude Indexes for Male Enlistees by Enlistment Region**

Enlistment Region	N	Mean Aptitude Index for Enlistment Region							
		Mechanical		Administrative		General		Electronics	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	6,913	62.15	19.81	63.05	19.56	66.75	21.15	64.56	20.95
2	11,777	63.75	19.83	60.84	20.75	63.44	19.85	61.17	18.66
3	14,113	58.60	17.98	60.40	20.35	61.10	20.78	61.56	21.02
4	16,444	54.03	24.34	56.70	23.72	57.11	24.98	56.03	24.72
5	7,880	60.40	17.98	59.72	17.65	61.51	17.98	63.44	19.85
6	11,535	65.10	20.00	62.75	18.66	64.79	20.25	66.33	22.15
7	11,673	66.56	22.73	63.15	19.59	64.79	20.25	65.39	21.45
8	13,124	52.75	18.65	57.24	19.27	59.72	17.65	54.10	18.45
9	14,425	68.33	20.01	61.33	20.33	65.32	21.03	66.10	21.78

Comparison of the data from Tables 4 and 5 reveals some similarities in the regional aptitude patterns for male and female enlistees. The most striking feature, however, is the higher scores for the WAF than for the male enlistees on the Administrative and General aptitude indexes across all regions.

Compared with earlier WAF enlistees (Lecznar, 1965), the 1968 WAF accessions demonstrated considerably higher electronics aptitude. As a result of a recent change in personnel procurement policy for WAF, young women may now be enlisted into electronics career areas if they score 60 or above on the Electronics aptitude composite.

The WAF performance on the ASVAB, as shown in Table 4, reflects some of the same regional differences normally found in AQE performance of males (see Table 5). The highest mean score on the Electronics index was seen for WAF enlistees from region 3. Those from regions 6, 7, and 9 tended to score relatively high on the Electronics aptitude index, while those from regions 4 and 8 achieved relatively lower mean aptitude indexes. In contrast with the typical pattern seen for male enlistees, WAF enlistees from region 1 were not high on the Administrative aptitude indexes; rather, WAF enlistees from regions 6, 7, and 9 were high on these indexes. High performance on the General index was achieved by enlistees from regions 1, 6, 7, and 9. No direct comparison of male and female performance on the ASVAB by region was possible because data on ASVAB performance by enlistment region were not available on male samples.

It should be noted again that data on regional performance of WAF, shown in Table 4, should be interpreted cautiously because of the rather small samples for each region, as well as the highly selective recruiting practices which govern WAF enlistment. More definitive patterns should emerge as additional data become available for analysis.

III. COMPARATIVE PERFORMANCE ON TWO ADMINISTRATIONS OF THE AFWST AND THE AQE

Collection of Data

The experimental sample included 1,409 WAF and 618 male basic trainees who arrived at Lackland Air Force Base between September 1967 and March 1968. The WAF were in their twelfth day of training; the male enlistees were in their sixth day. The WAF were administered AQE-66 and either Form 7 or Form 8 of the AFWST. The tests were administered in a counterbalanced order to offset practice effects. The male enlistees were given AQE-66.

Three additional WAF samples were used to determine whether retest performance was affected by the day of training on which the test was administered. These samples were administered AQE-66 on their second (N = 105), seventh (N = 97), or twelfth (N = 89) day of training.

For each sample separately, means and standard deviations were computed for the aptitude indexes from the experimental tests and for the aptitude indexes from the operational tests. These two sets of scores were compared to determine whether there were significant differences between corresponding means. Percentages of WAF who would have failed to qualify for entry in the Air Force on the basis of their retest scores were also computed.

Table 6. **Performance of Male and Female Enlistees on Operational and Experimental Administrations of AQE-66**

AQE Aptitude Index	Operational Test Mean	Operational Test SD	Experimental Test Mean	Experimental Test SD	t Test	Significance Level
Female Enlistees Retested on 12th Training Day *(N = 1,409)*						
Mechanical	38.30	18.78	35.41	21.03	3.85	.01
Administrative	73.00	13.87	56.79	19.97	25.03	.01
General	70.59	12.59	60.62	19.61	16.06	.01
Electronics	55.54	17.36	47.52	21.59	10.87	.01
Male Enlistees Retested on 6th Training Day *(N = 618)*						
Mechanical	61.25	20.95	61.81	23.61	.21	ns
Administrative	62.35	22.21	58.38	23.62	2.33	.05
General	64.34	20.23	64.60	22.53	.21	ns
Electronics	63.69	22.18	64.34	23.81	.38	ns

Table 7. **Performance of Female Enlistees on Operational and Experimental Administrations of AQE-66 and AFWST**

Selection Measure	Operational Test Mean	Operational Test SD	Experimental Test Mean	Experimental Test SD	t Test	Significance Level
Female Enlistees Retested on 2d Training Day *(N = 105)*						
AQE Aptitude Index						
Mechanical	33.57	18.56	25.63	17.17	3.21	.01
Administrative	69.00	14.20	50.93	22.63	6.93	.01
General	68.38	13.03	53.87	20.00	6.23	.01
Electronics	50.76	17.44	40.60	20.39	3.88	.01
AFWST	63.83	11.14	56.40	23.51	2.93	.01
Female Enlistees Retested on 7th Training Day *(N = 97)*						
AQE Aptitude Index						
Mechanical	34.81	19.93	33.58	21.36	.41	ns
Administrative	70.10	14.80	55.36	20.85	5.69	.01
General	70.93	12.91	58.53	22.17	4.83	.01
Electronics	53.88	18.55	45.38	23.40	2.80	.01
AFWST	64.91	11.41	59.42	23.17	2.09	.05
Female Enlistees Retested on 12th Training Day *(N = 89)*						
AQE Aptitude Index						
Mechanical	33.46	18.00	27.18	18.28	2.31	.05
Administrative	68.82	13.51	51.53	18.98	7.00	.01
General	69.94	12.30	56.52	18.14	5.77	.01
Electronics	47.92	16.44	38.13	19.25	3.65	.01
AFWST	62.75	10.13	58.01	20.23	1.99	.05

Table 8. **Percentage of WAF Whose Retest Performance Was Below Qualifying Minimums[a]**

Basic Training Day	N	Percent below 40th Centile on AQE Administrative	Percent below 40th Centile on AQE General	Percent below Score of 42 on AFWST-5
2d	105	25.71	22.86	32.38
7th	97	19.58	18.56	26.80
12th	89	32.58	19.10	24.72
12th	1,409	16.48	13.15	

[a]All WAF had qualified for enlistment at the 40th centile on both the Administrative and General aptitude indexes.

Analysis of Data

Comparisons of operational and experimental AQE-66 mean scores for male and female enlistees are shown in Table 6. In all instances, WAF performance was significantly lower on retest. For the male sample, there were no significant differences between means on the operational testing and the experimental retesting for three of the aptitude indexes; however, the retest score on the Administrative index was significantly lower than the initial test score.

Table 7 shows comparisons between operational and experimental test scores for samples of WAF basic trainees retested on the second, seventh, and twelfth day of training. In every instance but one, mean retest performance was significantly lower than operational test performance. The single exception was the insignificant difference between test-retest scores on the Mechanical index for the test administered on the seventh day of training. On the basis of the relatively consistent finding of test-retest differences regardless of day of testing, it must be concluded that the retest performance decrement was not a function of the day of basic training on which testing occurred.

Table 8 shows the proportion of retest scores that were lower than qualifying minimums for the four WAF samples. It should be remembered that all WAF in this study did qualify at or above the 40th centile on both the Administrative and General AQE aptitude composites and achieved a minimum score of 42 on AFWST-5 or 47 on AFWST-6. On the basis of their retest performance, however, a substantial number of WAF apparently would not have qualified for enlistment in the Air Force.

IV. COMPARATIVE PERFORMANCE OF WAF ON THE AFWST AND THE AFQT

Collection of Data

An additional sample of 382 WAF enlistees, in their twelfth day of basic training, were administered the AFWST-5 and the AFQT-7A. These tests were given in counterbalanced order to offset practice effects. For each of the 382 subjects, operational AFWST and AQE scores also were obtained and recorded. From the United States Army Behavioral Science Research Laboratory, mean AFQT-7A subtest and composite scores for males were obtained.

Operational and experimental test scores on the AFWST were compared for the WAF sample. Means and standard deviations for females were computed for the subtests of the AFWST-5 and AFQT-7A and for the subtest and composite scores on these two instruments. Comparisons were also made of the performance of males and females on AFQT-7A.

Analysis of Data

Significant differences were found between mean performance on the AFWST-5 in the operational and experimental test situations; the mean score on initial testing was 62.70, compared to a mean of 56.01 on retest.

Comparisons of male and female performance on the AFQT are shown in Table 9. Although the composite score obtained by WAF enlistees was approximately 13 centile points lower than that of the male enlistees (40.62 vs. 54.0), the difference may be largely attributable to the extremely low scores for the WAF on the Mechanical Comprehension subtest.

Table 9. **Mean Performance of Male and Female Enlistees on AFQT-7A**

AFQT-7A Subtest	Number of Items	Female Enlistees		Male Enlistees[a]	
		Mean	SD	Mean	SD
AFQT Raw Score					
Arithmetic Computation	25	16.67	5.63	16.2	6.3
Word Knowledge	25	20.47	3.54	17.5	6.5
Mechanical Comprehension	25	6.45	3.19	15.2	5.6
Pattern Reasoning	25	13.62	5.61	15.6	6.4
AFQT Composite Centile	100	40.62	18.83	54.0	26.0

[a]Data on male performance obtained from the U. S. Army Behavioral Science Research Laboratory.

On the basis of these preliminary comparisons of male and female performance on the AFQT, it appears that this selection test can be adapted for use in screening WAF applicants. However, more extensive research is indicated to develop special keys to accommodate for recognized sex differences in certain aptitude areas and, further, to develop norms based on the performance of an appropriate standardization sample.

V. CONCLUSIONS

Several general conclusions may be drawn from the results of the studies:

1. There is a positive relationship between performance on aptitude measures and educational level.

2. There are significant differences between the test scores achieved on operational and experimental administrations of the same selection instrument. The findings of the lower scores on a retest, or experimental, administration (with scores for a substantial proportion of the examinees below qualifying minimums) raise certain questions regarding the practices and procedures of the test administrators reponsible for initial testing of enlistees. There is a critical need for rigid adherence to standard procedures for test administration, test scoring, and reporting of scores for Air Force applicants.

Comparisons of male and female performance on the AQE and ASVAB yielded the following specific findings and conclusions:

1. Mean performance of male and female accessions on aptitude measures has increased since 1962.

2. WAF enlistees achieved higher Administrative and General aptitude indexes on the AQE-66 and the ASVAB than did male enlistees.

3. The Electronics aptitude indexes of the WAF enlistees were much closer to the scores of male accessions than they have been in previous years. The data appear to justify a recent change in personnel procurement policy for WAF which allows for the enlistment of women in the electronics career area with an Electronics AI of 60 or better.

4. Although the mean AFQT composite score for WAF was lower than the mean score for male enlistees, the difference may be largely attributable to extremely low WAF scores on the Mechanical Comprehension subtest. These gross findings suggest that the AFQT can probably be adapted for use in screening WAF applicants if appropriate keys and norms are developed to accommodate for recognized sex differences in certain aptitude areas.

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APPENDIX

Table 10. **Subtest Components of AQE-66 Aptitude Composites**

Subtest	Number of Items	Aptitude Composite			
		Mechanical	Administrative	General	Electronics
Arithmetic Computation	60		X		
Arithmetic Reasoning	16		X	X	X
Data Interpretation	10				X
Electrical Information	15				X
General Mechanics	15	X			
Hidden Figures	16	X		X	
Mechanical Principles	15	X			
Pattern Comprehension	18				X
Shop Practices	15	X			
Word Knowledge	30		X	X	

Table 11. **Subtest Components of ASVAB Aptitude Composites**

Subtest	Number of Items	Aptitude Composite			
		Mechanical	Administrative	General	Electronic
Coding Speed	100		X		
Word Knowledge	25		X	X	
Arithmetic Reasoning	25			X	
Tool Knowledge	25	X			X
Space Perception	25				X
Mechanical Comprehension	25	X			
Shop Information	25	X			
Automobile Information	25	X			
Electronics Information	25				X

Table 12. **Correlation of ASVAB with Corresponding AQE-66 and Project TALENT[a] Aptitude Indexes**

(N = 4,371 male enlistee ASVAB standardization sample)

ASVAB AI	AQE-66	TALENT
Mechanical	.75	.80
Administrative	.75	.72
General	.84	.86
Electronics	.84	.84

[a]After Vitola and Alley, 1968, p. 3.

Table 13. **Intercorrelations of Operational and Experimental Variables for WAF Enlistees**

Variable	Intercorrelation Between Variables																			Mean	SD
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
AFWST, Form 5 or 6																					
1. Centile																				65.47	12.68
AQE-66 Aptitude Indexes																					
2. Mechanical AI	.35																			39.45	18.58
3. Administrative AI	.43	.33																		72.66	14.61
4. General AI	.52	.65	.61																	70.18	13.22
5. Electronics AI	.47	.58	.65																	55.98	17.96
ASVAB Subtest Raw Scores																					
6. Coding Speed	.12	.13	.11	.12	.17															62.42	12.98
7. Work Knowledge	.24	.13	.16	.28	.21	.18														20.90	3.78
8. Arithmetic Reasoning	.43	.29	.29	.38	.45	.31	.48													14.60	5.63
9. Tool Knowledge	.05	.08	.04	.02	.10	.07	.08	.13												5.54	2.76
10. Space Perception	.31	.33	.12	.32	.39	.16	.27	.44	.14											11.61	5.21
11. Mechanical Comprehension	.24	.30	.06	.24	.32	.16	.30	.38	.16	.45										9.97	3.88
12. Shop Information	.13	.25	.02	.17	.26	.15	.24	.32	.26	.33	.40									7.31	3.41
13. Automobile Information	.17	.21	.08	.14	.22	.13	.21	.28	.20	.23	.31	.33								5.00	3.29
14. Electronics Information	.23	.24	.08	.22	.27	.08	.30	.37	.25	.33	.36	.42	.38							8.88	4.06
AFWST, Form 7 or 8																					
15. Centile	.46	.32	.29	.46	.45	.27	.62	.74	.16	.47	.42	.34	.33	.41						56.16	28.67
ASVAB Aptitude Indexes																					
16. Mechanical AI	.32	.46	.19	.37	.46	.25	.33	.49	.48	.46	.67	.67	.64	.51	.55					24.11	14.30
17. Administrative AI	.21	.22	.47	.24	.26	.91	.46	.46	.09	.25	.25	.23	.18	.19	.47	.39				69.57	20.11
18. General AI	.41	.37	.34	.48	.45	.31	.78	.78	.12	.41	.37	.30	.29	.37	.79	.59	.59			65.07	19.91
19. Electronics AI	.44	.41	.26	.44	.52	.27	.47	.82	.20	.76	.51	.44	.38	.66	.73	.66	.45	.75		51.46	21.33

Table 14. **Percentage of 1968 WAF Enlistees at Each ASVAB Aptitude Index**

ASVAB Aptitude Index	Percentage of Enlistees at Given Aptitude Index			
	Mechanical	Administrative	General	Electronics
95	0.00	18.00	11.77	3.75
90	0.39	5.93	3.95	3.85
85	1.38	8.11	14.34	10.18
80	1.28	10.97	10.97	13.15
75	1.68	7.91	7.91	9.19
70	2.37	7.41	6.82	12.16
65	7.02	9.99	14.34	12.26
60	9.00	9.49	7.41	5.93
55	11.57	7.51	8.60	9.49
50	19.68	3.50	4.64	5.14
45	9.49	2.96	3.06	6.13
40	12.16	1.87	2.96	5.04
35	9.59	1.68	1.08	2.07
30	5.53	0.98	1.18	0.69
25	5.93	1.28	0.79	0.49
20	1.18	1.58	0.09	0.39
15	0.89	0.00	0.00	0.00
10	0.79	0.59	0.00	0.00
05	0.00	0.00	0.00	0.00
01	0.00	0.09	0.00	0.00

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13. ABSTRACT

Male and female enlistee samples were compared for total groups and by enlistment region in terms of their performance on the Airman Qualifying Examination (AQE) and the Armed Services Vocational Aptitude Battery (ASVAB). Women in the Air Force (WAF) test-retest performance was evaluated on the Armed Forces Women's Selection Test (AFWST) which is used throughout the Department of Defense. WAF performance on the AFWST was compared with their performance on the Armed Forces Qualification Test (AFQT), the instrument currently used to establish the mental ability level of males entering the military services. It was found that mean aptitude indexes have increased over time for both male and female enlistees on the AQE and the ASVAB. A positive relationship was demonstrated between level of education and aptitude index. Regional aptitude patterns for WAF did not conform to those traditionally found for male enlistees. A significant difference was found in WAF performance in a test-retest situation for both the AQE and the AFWST. WAF performance on the AFQT was somewhat lower than that of male enlistees, with the difference attributed primarily to the lower achievement by the WAF on the Mechanical Comprehension subtest.

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aptitude index						
region of enlistment						
educational level						
male-female comparisons						
test-retest comparison						
mental ability category						